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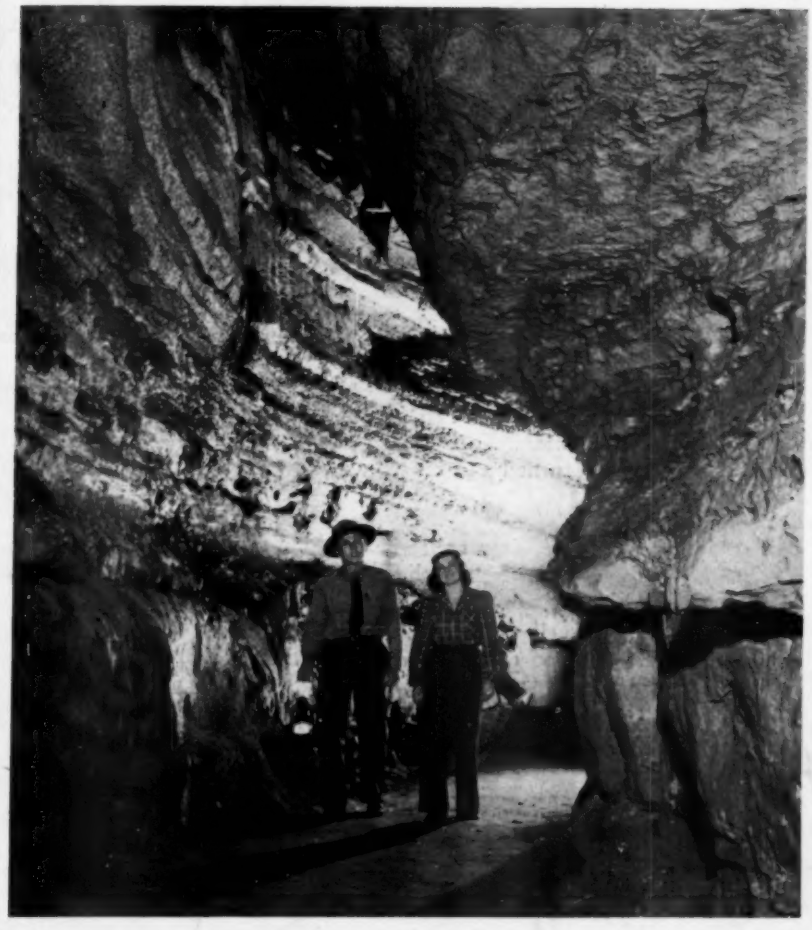
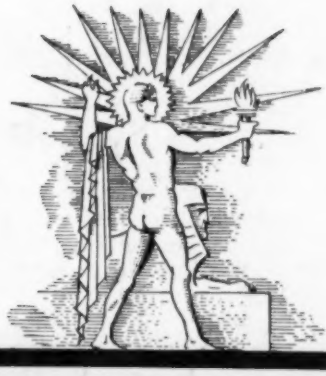
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •





September 27, 1941

Cave for Uncle Sam

See Page 201

A SCIENCE SERVICE PUBLICATION

Do You Know?

The world's *whale* catch today is larger than in the famous New England whaling era.

It takes 26 sheep to provide the wool for a *soldier's clothing* during his first year of service.

A filament of *nylon* wound tightly around violin strings of gut is said to produce a string protected from moisture.

From instrument readings it is judged that *winds* on Mt. Washington, New Hampshire, reach maximum velocities of about 200 miles an hour.

A survey at the University of Oklahoma indicates that 14,583 words are used frequently enough to be considered within a child's working *vocabulary*.

By one estimate, the Incan Empire in prehistoric South America took in 8,000,000 *Indians*, but another estimate allows scarcely more than half that number.

Horses get credit for having horse sense, but cows have *cow sense*, says an agricultural extension advisor: in one herd of 100 cows all respond to their names.

Government bird experts tell this one: a *blue-winged* teal recently crashed a double-strength glass window of an observation fire tower in North Dakota, breaking a round hole in the glass; and the hard-headed bird apparently was not hurt.

QUESTIONS DISCUSSED IN THIS ISSUE

Most articles which appear in SCIENCE NEWS LETTER *are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.*

AGRICULTURE

What double crop may be obtained from tobacco too rank for smoking? p. 198.

ASTRONOMY

Why is Mars so bright at this time? p. 202.

ENGINEERING

What can you put in inner tubes to reduce the danger of static? p. 201.

What modern method of house heating is adapted from that used by ancient Romans? p. 195.

INVENTION

How can a shell be enabled to explode before striking its target? p. 199.

MEDICINE

Of what dread blood disease is radioactive phosphorus a helpful treatment? p. 195.

What rare operation restores invalids to active lives? p. 196.

What vitamin may be a cure for lice? p. 201.

NUTRITION

Of what does the vitamin B sandwich consist? p. 200.

What is the eighth vitamin B, newly discovered? p. 201.

PHYSICS

How can dry ice be used to detect counterfeit jewels? p. 203.

What caused the beautiful display of northern lights visible on September 18? p. 197.

PHYSICS—RADIO

What radiation from the sun has been blamed for poor radio reception? p. 200.

PHYSIOLOGY

How can your sitting position make your feet hurt? p. 200.

How do vitamins aid every life process? p. 206.

RESOURCES

How could coal be transported by pipe line? p. 200.

PLANT PATHOLOGY

What new disease attacks mimosa trees? p. 201.

PUBLIC HEALTH

How much infantile paralysis was reported in the Middle Atlantic States in the week of September 13? p. 198.

What disease is taking an increasing toll in Europe because of the war? p. 207.

ZOOLOGY

How can you tag a skunk without being sprayed? p. 198.

The plastics that Brazil is making from *coffee* can be turned out in all colors except white.

Special *galleries for children* are to be opened at New York's Metropolitan Museum of Art this autumn.

There are less than 20 of the powerfully magnifying *electron microscopes* in existence today, and of these the United States has eight.

Naphthalene flakes or mothballs are said to be sometimes effective in driving *skunks* from a den too near a house.

Swedish farmers are using *whey* in a kind of molasses feed for livestock, to help solve the shortage of feed.

Children's *mental growth* is faster in autumn and winter than in spring and summer, a University of California psychologist reports.

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MEDICINE

Dread Blood Disease Treated With Radioactive Phosphorus

Abnormal Red Blood Cells Produced by Polycythemia, Disease of Bone Marrow, Killed by Charged Atoms

A PRODUCT of the atom-smashing cyclotron, radioactive phosphorus, is announced as a treatment for a serious blood disease by Dr. John Lawrence, brother of the cyclotron inventor Ernest O. Lawrence, who is director of biological and medical research of the Radiation Laboratory at the University of California.

Polycythemia, a deadly disease of the hemoglobin-producing bone marrow, causes an abnormal multiplication of red corpuscles in the blood and is usually treated by drugs, bleeding, radium and X-rays. This new form of treatment, although not generally used, seems to offer advantages over the older methods.

Elements made radioactive in the cyclotron emit rays similar to those of natural radium or X-rays, but as they travel in the system as natural phosphorus, these charged phosphorus atoms are carried directly to the bone-marrow where red corpuscles are normally produced. Harmless to normal body tissues in the small amounts needed, the charged phosphorus atoms enter and destroy the abnormal cells. If orange juice is taken at the same time it speeds phosphorus absorption and aids retention so that even smaller doses are needed.

So effective were the phosphorus radiations in their action on the widespread abnormal red blood cells that the blood count of patients was reduced from 7,000,000 to the normal 4,500,000.

One reason for the destructive action of radio-phosphorus in abnormal cells while normal cells are unharmed is the fact that polycythemia-multiplied cells are new cells, and radioactive research shows that all new cells, normal or abnormal, use large supplies of phosphorus in their growth. When the phosphorus taken up by these rapidly multiplying cells is radioactive, they are destroyed by the atomic "explosions" that are continuous in the substance.

Radioactive elements produced in the cyclotron are being used in the treatment of several other types of abnormal growth.

Dr. L. A. Erf, research associate now in the United States Army Medical Corps, assisted Dr. Lawrence in the polycythemia research.

Science News Letter, September 27, 1941

AS ROMANS DID

With rising costs of heating, owners of small houses may be interested in this modern adaptation of an ancient method of warming a house developed by a plant physiologist who studied heat transfer.

ENGINEERING

Warm Floor Makes Whole House Warm

WITH the prospect of steep rises in the cost of coal and oil, a modern adaptation of an ancient way to warm a small house efficiently and economically will be welcome to many.

The ancient Romans made comfortable many of their baths and villas by means of hot air ducts under the floors. More recently some schools and churches in England and France have been fixed up for cold weather in a smiliar manner. The idea has been slow of acceptance in the United States.

Prof. Raymond H. Wallace, of Connecticut State College, has tried out the principle in a log cabin built from pines destroyed by the New England hurricane of three years ago, and finds it works. Prof. Wallace is not a heating engineer. He is a plant physiologist. His interest in the problem arose from a technical study of heat transfers which determine leaf temperatures. Also, he does not think radiators help interior decoration.

The cottage was complete except for partition and floors when the experiment was decided upon. The ground floor was graded as for a lawn. Upon this roofing felt was laid. About 700 feet of ordinary three-quarter inch black iron pipe and about 100 three-quarter inch malleable iron L's were assemb'ed to form grids in the floor. Six inches of concrete were then poured over the pipes.

Upstairs was placed another grid — first roofing felt, next one-half inch of cement, then the pipes, and lastly, three inches of concrete. The two sets of grids were hooked up with a circulation pump on a hot water boiler in a lean-to solarium. An automatic oil burner supplies the heat.

Science News Letter, September 27, 1941

Many ornamental and *shade trees* die each summer because home owners go vacationing and leave them without water when they need it.

MEDICINE

Rare Operation Restores Invalids to Active Lives

Removal of as Much as Three Fourths of Hardened Pericardium Frees Heart for Normal Functioning

A HEART operation that is returning bed-ridden invalids to normal, active lives is being successfully used by thoracic surgeons in the University of California Medical School.

Sometimes rheumatic or tuberculous infections will invade the pericardium, the membranous, fluid-filled sac surrounding the heart. Normally this sac is flaccid and roomy enough to permit easy expansion and contraction of heart muscles in their blood-circulating action.

When the pericardium becomes infected, a condition known to doctors as constrictor cordis or Pick's disease results. Calcium, the hardening substance of bones, begins to coat the membranous sac, and it soon takes on a marblelike appearance as it hardens and shrinks. The heart is so restricted in its pumping action that only about half the normal amount of blood can be handled. Besides extreme debility, the abdomen swells and the breath becomes short and difficult.

University of California surgeons, knowing that the pericardium is not essential to the heart's functioning, removed a large part of the bony sac; sometimes as much as three-quarters of the calcium carbonate-hardened membrane, a most delicate operation, but performed successfully on four extreme cases. Even before the operation was completed the freed heart began to return to normal functioning and the painful symptoms soon were relieved. The patients live comfortably without a pericardium and their hearts are able to pump a normal supply of blood throughout the body again.

Surgeons who conducted the operations on this rare disease are all members of the thoracic surgery staff of the California Medical School, headed by Dr. Harold Brunn, clinical professor of surgery, and including Dr. Alfred Goldman, instructor in surgery, Dr. Brodie Stevens, assistant clinical professor of surgery, and A. L. Brown, clinical instructor in surgery.

Science News Letter, September 27, 1941

MEDICINE

Safer Emergency Transfusions With Universal Donor Blood

SAFER emergency blood transfusions may be achieved by a method announced by Dr. Ernest Witebsky and Dr. Niels C. Klenshoj, of the Buffalo, N. Y., General Hospital (*Science*, Sept. 12).

The method is a treatment of group O blood, the universal donor blood sometimes used for emergency transfusions when there is no time to type the patient's blood or when blood of the patient's blood group is not immediately available.

Group O blood is used in this way because, except in very rare instances, the blood cells of group O are not agglutinated or stuck together by any normal human blood serum. If the cells of the donor's blood should be stuck together by the patient's blood serum, the patient would have a severe and possibly fatal reaction.

To avoid this difficulty, the Buffalo investigators have added to group O blood tiny amounts of the two sugar-like substances which are characteristic of group A and group B bloods. Addition of these recently isolated chemicals neutralizes the anti-A and anti-B antibodies in group O blood which could cause transfusion reactions in some patients.

Success in over 100 transfusions with "neutralized" O blood given mainly to patients belonging to groups A, B and AB without previous determination of the blood group of the patient and sometimes even without cross matching has been achieved, the Buffalo scientists report. They point out, however, that there are still many sources of transfusion reactions which are not influenced by the addition of group-specific substances to O blood.

Science News Letter, September 27, 1941

NUTRITION

Physician Doubts Statement Of Vitamin Deficiency

THE NUMBER of people in the United States suffering from lack of vitamins is far below the 45,000,000 figure given at the National Nutrition Conference for Defense, in the opinion of Dr. Logan Clendenning, of Kansas City, Mo.

In a report to the *Journal of the American Medical Association* (Sept. 20), Dr. Clendenning seems to challenge the statement of Federal Security Administrator Paul V. McNutt that 45,000,000 Americans "lack the foods we know are essential for health," and that another 50,000,000 have impaired health because of poor diet, and similar statements by physicians and nutrition authorities.

Figures Dr. Clendenning has from Massachusetts General Hospital, Boston; The Johns Hopkins Hospital, Baltimore; County Hospital, Santa Barbara, Calif.; Kansas City General Hospital and the University of Kansas Hospitals show that a very small percentage of the patients suffered from vitamin deficiency.

"If these figures are a guide to the incidence of vitamin deficiency in the United States, it is infinitely far below 40%, or 95,000,000," Dr. Clendenning declares.

"I would not wish, naturally, these findings to be interpreted as casting any doubt on the validity of the vitamin doctrine or to imply that there should be any relaxation in the instruction of the public in the requirement of vitamin containing foods in the dietary," Dr. Clendenning declares. "But they do indicate, I think, that the American public is getting its vitamins; in fact, with modern food production, transportation, refrigeration and distribution it is pretty hard for an American to avoid vitamins on an ordinary diet. This seems to apply even to the population levels of low intelligence and income."

Science News Letter, September 27, 1941

CAUSE OF AURORA

This most unusual group of sunspots travelling over the face of the sun caused H. W. Wells of the Carnegie Institution of Washington to predict, two days in advance, the beautiful display of northern lights that glorified the heavens on September 18. This photograph was taken at the U. S. Naval Observatory on September 16.

PHYSICS

Brilliant Aurora Display Predicted Two Days Ahead

Tremendous Exploding Sunspots in Unusually Large Group Gave Warning of Disruption of Radio Reception

ONE of the most brilliant displays of northern lights on scientific record was predicted two days before it occurred on Thursday, Sept. 18.

Studying the formation of sunspots as reported by the U. S. Naval Observatory, H. W. Wells of the Department of Terrestrial Magnetism of the Carnegie Institute of Washington on Tuesday concluded that there was to be a display of aurora. He made the prediction to Dr. John A. Fleming, head of the laboratory, and through government agencies a number of observing stations, some as far away as Alaska, were asked to be on the alert.

The Cheltenham, Md., magnetic station of the U. S. Coast and Geodetic Survey was also enlisted. Early Thursday morning one of the most violent magnetic storms on record began.

Covering the whole sky with moving sheets and streamers of transparent light, some of it green and pink, the great aurora of September 18, as it will be known historically, provided a most spectacular sky sight at Washington, the waves of light seemed to be coming from directly overhead, forming a great corona. There was a greenish haze over the sky as the lights flashed on and off as though a master electrician were painting a scene with cosmic flood light. Backgrounding the aurora were the stars which seemed even more brilliant than ever in the transparent sky.

Tremendous exploding sunspots caused the heavenly display, although the spectacle of the aurora itself originates only about 50 to 80 miles above the earth. Particles emitted from the sun at tremendous speeds take about 2 days to travel to earth, smashing into atmospheric atoms and molecules, mostly oxygen and nitrogen, stripping them of their outer electrons and causing them to luminesce. Scientists in laboratories can duplicate on a small scale this phenomenon. For details on the aurora, see *SNL*, Sept. 20, p. 187.

When sunspots in passing over the center of the sun are rapidly growing in area, then Mr. Wells finds that atmospheric disturbances accompanied by bad radio reception, magnetic storms that disrupt wire communications, and aurora may be expected.

Dr. Harlow Shapley, director of Harvard College Observatory, pronounced the display as seen from Cambridge the most brilliant seen there, equalling northern lights seen in much more northern latitudes. At Mt. Wilson Observatory, Calif., a red aurora was observed.

Observed by millions, the aurora excited wonder and admiration. Telephone calls flooded observatories, scientific institutions and newspaper offices.

Science News Letter, September 27, 1941

By increasing efficiency of maintaining and firing *furnaces,* home owners and operators of apartments and office buildings can save more than $150,000,000 in fuel bills a year, says the Bureau of Mines.

In the present war, Belgium's University of *Louvain* has been so damaged that only 15,000 volumes in a library of 900,000 are left intact.

The first *mink* raised on ranches in the United States yielded inferior pelts, but now mink furs from farms tend to be superior to wild mink.

About 5,500 pounds of *silk yarn* are used each year by one electric company as wire covering in radio, meter, and small instrument coils, but nylon or rayon can be used when present stocks are gone.

UNUSUAL JOB

The little head just peeping out of the box is that of a skunk that Naturalist Crabb is tagging. This awesome job has been accomplished for about 75 skunks without assault on the tagger, Mr. Crabb says.

ZOOLOGY

Nervy Naturalist Puts Tags in Ears of Skunks

A JOB that would bring pallor to the cheek of the hardiest cowboy that ever roped and branded an "ornery" steer is all part of the day's work for Wilfred D. Crabb of the Iowa Cooperative Wildlife Research Unit, with headquarters at Iowa State College. Mr. Crabb catches spotted skunks, inserts metal identification tags in their ears—and gets away unsprayed.

He uses a simple but effective box trap of his own devising, but key implement in his technique is what he calls a tagging chute. This is a narrow wooden tunnel, just big enough for the long, narrow body of the spotted skunk, but not wide enough to let the animal turn around. The trapped skunk is induced to enter the chute, and a wooden block is pushed in behind it to prevent backing out.

The opposite end of the chute can be opened. As soon as the little furry head appears, Mr. Crabb seizes it with a leather loop or a pair of leather gloves. This is a precaution against being bitten. It is then a simple matter to insert an earring-like metal tag with code identification inscription. Subsequent recapture of the tagged animal gives information regarding its age, migration range, etc.

"Approximately 75 spotted skunks have been tagged in this chute and not one of them has been able to pollute the operator with scent," reports Mr. Crabb.

The apparatus and technique for skunk-tagging is described in detail in the *Journal of Wildlife Management.*

Science News Letter, September 27, 1941

AGRICULTURE

Vitamin and Poison From Same Harvest of Tobacco

Species of "Weed," Too Rank for Smoking, May Provide Both Nicotine and Nicotinic Acid Disease Preventive

VITAMINS for the enrichment of bread and poison for insect pests may be the double yield of one species of tobacco, so rank that even the hardiest veterans cannot smoke it. Tobacco growers whose export market has been upset by the war are experimenting with its cultivation, the U. S. Department of Agriculture states, and at the new Eastern Regional Research Laboratory in Philadelphia chemists are trying out methods for extracting the two valuable compounds.

The tobacco species in question is *Nicotiana rustica,* a half-wild cousin of *N. tabacum,* or regular smoking tobacco. Tobacco's rustic cousin has high content in both nicotinic acid, which is the pellagra-preventing vitamin, and nicotine, the deadly poison used in great quantities in insect sprays.

Because of the resemblance between the two names, confusion often arises, leading some to believe that nicotinic acid has some of the poisonous properties of nicotine. This is not the case at all. Nicotinic acid was so named because it was first studied in Nicotiana, the tobacco plant, but it has since been found in a great variety of plants, including yeast. It is perhaps a pity it was not found first in yeast; then it would have been called zymic acid and nobody would have been bothered.

If the effort to increase the country's supply of nicotinic acid from rustic tobacco proves successful, it will go far toward relieving one of the most troublesome of present chemical bottlenecks. Estimates are that 200,000 pounds of nicotinic acid will be needed this year for enrichment of flour, and perhaps 20,000 pounds more for the direct treatment of pellagra. This demand is about 20 times as great as the total quantity of nicotinic acid manufactured in 1940.

Nicotinic acid is made synthetically from coal tar. However, the chemicals needed for its production in this way are expensive, and they are becoming increasingly difficult to get at all. Nicotinic acid from the plant source is more costly to start with, but it requires for its processing only nitric acid, which is cheap and abundant.

Science News Letter, September 27, 1941

PUBLIC HEALTH

"Sleeping Sickness" Decreases in West

INCREASED numbers of infantile paralysis cases in the northern part of the country brought the total for the nation during the week ending Sept. 13 up to nine more than the previous week's total, the U. S. Public Health Service announces.

The New England States reported 48 cases, compared with 27 the previous week. The Middle Atlantic states reported an increase from 169 to 213. Most of these cases were in New York State and New York City, which together had 109 cases compared with 71 the previous week. Ohio, Illinois, Indiana and Michigan also reported increases.

The Southern states showed definite decreases, and since this season's outbreak started in the south, public health authorities believe the epidemic is waning for the country as a whole.

Human cases of horse "sleeping sickness," technically termed equine encephalomyelitis, has declined in all four western states (North and South Dakota, Minnesota and Colorado) where it was epidemic in the late summer.

Science News Letter, September 27, 1941

INVENTION

Shell "Sees" Target and Explodes Before It Strikes

Might Be Useful in Case of Fire Against Troops In the Open; Accomplished by Photoelectric Cell

A FIRING DEVICE for shells or bombs, that "sees" the target it is approaching and detonates the explosive charge at the most effective distance, was granted a U. S. Patent recently. It depends on the reaction of a photocell within an opening in its nose, picking up reflected radiation from a group of lamps that throw their beams forward through focussing lenses.

The novel fuse mechanism is the invention of Clyde B. Ferrel of San Francisco, and is protected by patent 2,255,245. For some types of attack, the inventor points out, it is highly desirable to have the projectile explode before it actually strikes the target. This is the case in fire against troops in the open, where a burst at a height of a few feet is more effective than an impact burst, because in the latter case the shell has time to bury itself in the ground, thereby muffling the violence of the explosion.

Time shell and shrapnel, designed to obtain these bursts in the air, have always depended on either powder-train, or, more recently, clockwork fuses. However, it is difficult to set a time fuse with unfailing accuracy.

With his photoelectric fuse, Mr. Ferrel claims, it will be possible so to adjust the focus of the lenses that a burst can be obtained at any desired distance above or in front of the target. While any type of radiation can be used, he prefers invisible infrared light, with suitable filters to prevent chance illumination from other sources from causing premature bursts.

Science News Letter, September 27, 1941

Many Aviation Inventions

A NUMBER of inventions in the field of aviation feature the recent crop of patents. One, issued to the noted German aircraft designer Claude Dornier, is for a brake to slow down dive bombers, or ordinary aircraft coming to a landing. It consists of a group (typically four) of scoop-like leaves or flaps, hinged at the tail of the fuselage, to open out like the petals of a giant flower and catch the air. They can be brought down to lie flat against the fuselage again by means of a screw-threaded central column. This patent, No. 2,254,591, was granted on an application filed in the fall of 1939, shortly after the outbreak of the war.

A type of airplane propeller blade construction is covered by patent 2,254,821, issued to an inventor in London, Jakob Heinrich Haw. Mr. Haw builds his blades out of transverse layers or laminae of wood, plastic or other light material, bolted together with metal rods running lengthwise through them. These rods have anchoring projections at suitable intervals, and nuts to keep them properly tightened.

Another British invention is an airplane gun turret, on which patent 2,254,678 was granted to L. G. Frise of Bristol, and assigned by him to the Bristol Aeroplane Company, Ltd. In most turnable gun mounts for planes, the turret and the gun or guns form a single unit. In Mr. Frise's invention, the gun mount is an independently operable central column within the turret.

A streamlined seaplane wing float, designed to reduce air resistance in flight, is the invention of Walter S. Diehl, U.S.N., on which patent 2,255,046 was issued. Right to use this invention without payment of royalty is granted to the United States Government.

Science News Letter, September 27, 1941

Unscrambling Metal Alloys

THE DIFFICULT job of unscrambling the metallic omelets known as alloys is undertaken by a process patented (No. 2,254,805) by two German inventors, Erich Junker and Willibald Leitgebel, of Berlin.

Their process depends on the fact that metals become most brittle at high temperatures, just short of their melting points. To separate, say, lead out of a lead-aluminum alloy, the metal is heated to a point a few degrees short of the melting point of lead (327 degrees Centigrade), and then violently pounded or shaken. The lead comes out as a powder, leaving the aluminum. Similar procedure is followed with other metallic mixtures of unlike melting points.

Science News Letter, September 27, 1941

ARCHAEOLOGY

Study Reveals How Spain Defended Early America

HOW Spain evolved a strong military and naval base at St. Augustine, Florida, to defend its holdings in early America, is revealed in a study of the settlement's evolution directed by Verne E. Chatelain of the Carnegie Institution of Washington.

The base had the duty, not only of keeping control of the vague and vast "Continent of Florida" that spread inland, but also of patrolling the Bahama Channel to guard Spanish treasure fleets from attack. Warlike Indians and pirates were recurrent enemies.

Making St. Augustine the center of Spain's northern New World Empire in 1565, settlers and soldiers built the first houses mainly of wood, copying Indian construction. Bare earth served as floors. Roofs, sharply pitched, were thatched with palm.

Later, more permanent houses had thick, solid walls and an upper story reached by outside stairs. Kitchens were outside the houses, and rudely fashioned.

In time, Florida's rock-like coquina, formed of small shells naturally cemented together, became the building stone of St. Augustine's important buildings and of many homes.

Streets of the early fortified town were unpaved, says Mr. Chatelain. Overhanging balconies of opposing homes nearly met, so narrow were the streets.

Life in the early base town was more colorful than in such places today. Religious processions, Spanish ladies in gay dresses, glitter and color of uniforms brightened street traffic, and behind high garden walls Spaniards grew masses of floral blooms. But it was no New World paradise, adds Mr. Chatelain. The people feared attacks, and common soldiers and their families lived in such deep poverty and debt that they rarely went beyond St. Augustine's walls.

The study which Mr. Chatelain has made was started by citizens of St. Augustine and Florida, cooperating with the Carnegie Institution and other organizations and individuals.

Science News Letter, September 27, 1941

NUTRITION

Vitamin B Sandwich Proposed to Scientists

PLACING upon the national health menu of a new low cost vitamin B sandwich was advocated by Dr. Tom D. Spies, of the Universities of Texas, Alabama and Cincinnati, at the vitamin symposium held at the University of Chicago.

The filling of the prophylactic and therapeutic sandwich would be peanut butter combined with up to 20% dried brewer's yeast. The outside of the sandwich advocated by Dr. Spies would consist of peeled wheat bread produced by the Earle flotation process of manufacture.

The mixture of peanuts and yeast is a good source of the natural vitamins of the B complex and high in protein, fat and calories as well, while the bread, Dr. Spies said, furnishes more proteins, vitamins and minerals than are contained in white bread or so-called whole wheat bread.

Science News Letter, September 27, 1941

PHYSIOLOGY

If Your Feet Hurt It May Be Way You Sit

IF YOUR feet hurt, it may be, strangely enough, because of the position you take when sitting. Faulty position of the feet while sitting is a new cause of aching feet discovered by Dr. Philip Lewin, of Chicago. He describes it in his book for physicians, *The Foot and Ankle.* (*Reviewed, SNL, this issue.*)

The pain in this kind of aching feet comes in the metatarsal region between the toes and the instep. Doctors call the ailment metatarsalgia. Besides the pain there may be rigidity and muscular spasm. Women are more likely to have metatarsal troubles than men because they more often wear improper or badly fitting shoes, short stockings and tightly gartered stockings. Many conditions may cause the trouble, ranging from arthritis to chilblains.

Sitting with your heels off the floor and your toes turned up, and thumping or pressing on the tips or balls of the toes causes the trouble very often, Dr. Lewin believes. Short-legged persons are very likely to sit this way, but Dr. Lewin says he has seen the position taken by long-legged persons too, and by doctors, lawyers, professional artists, stenographers, and even orthopedic surgeons. He has observed it in people at games and sporting events, at meals, at their desks, at the card table and during periods of relaxation.

Sitting in this "half-toe" position exaggerates the depression of the metatarsal arch and the strain on the heads of the metatarsal bones, joints and their capsules, ligaments, tendons and muscles. Push the knuckles of one hand down with the thumb of the other and at the same time squeeze the knuckles together and you will get an idea of how and why your feet hurt if you sit much with them in this position.

If your feet hurt, you should consult a physician, but no amount of treatment with shoes, pads, exercises and the like, Dr. Lewin says, can undo the damage done over long and short periods of improper sitting posture. So watch your feet when you sit down, keeping them flat on the floor.

Science News Letter, September 27, 1941

RESOURCES

Pulverized Coal Pumped Through a Pipeline Urged

PULVERIZE coal at the mines, add water to make a sludge, pump the sludge through pipelines to the consuming end, remove the moisture and blow the pulverized coal into industrial furnaces. This suggestion was made by Prof. H. E. Babbitt of the University of Illinois.

This would cut the transportation cost in half, he said, and release rail facilities for war-time demands. Whether the cost of such pipelines would be prohibitive is a question on which he declined to comment.

Until now, pipelines have been confined to transporting liquids. A research on the flow of sewage sludges, recently completed at the University of Illinois by Prof. Babbitt and David H. Caldwell, special research assistant, has opened the way for pipeline transportation of any material that can be made into a sludge. Among many others, mixed concrete can be pumped through pipelines on construction jobs, such as big dams.

The research has provided tables and formulas for both steady and turbulent flow and other data which will help engineers to plan pipelines for solid materials. The results of the research have been published in two bulletins of the University's Engineering Experiment Station.

Science News Letter, September 27, 1941

IN SCIENCE

GENERAL SCIENCE

Popular Science Books Issued in Bulk in Russia

TO MAKE the Russian people science-minded, the Soviet Union publishes popular scientific books in very large editions—700,000 copies of about 70 such books being scheduled for this year.

A report just received in the United States, describing 1941 progress of this popularization of science program before the present Nazi invasion began, says that members of the Soviet Academy of Sciences and other prominent scientists are among authors of the latest publications.

Especially popular, says the report, is a series on "Modern Problems in Science and Technics," which describes the latest achievements in chemistry, biology, physics, mathematics, geography, natural science, and engineering.

Science News Letter, September 27, 1941

PHYSICS—RADIO

Ultraviolet From the Sun Blamed For Poor Radio

ULTRAVIOLET rays from the sun are mainly responsible for poor radio reception when the sun is high, or when sunspots are many, it has been shown by measurements carried out by J. R. Ashworth, an English scientist. (*Nature,* Aug. 23.)

That ultraviolet light is the chief culprit has long been suspected because it is capable of producing changes in the upper atmosphere that are known to affect radio recepton. But this had remained theory. The measurements of Mr. Ashworth now show it to be fact.

The quantity measured was the proportion of ultraviolet rays in the sunlight reaching the earth. This proportion was found to be less when the sun was high, less in summer than in winter, less when sunspots were plentiful, thus agreeing with the times when radio reception is poor. That the proportion of ultraviolet in the sunlight reaching the earth is less at those times means that more of it is used up in the upper atmosphere, in producing those changes that reduce radio reception.

Science News Letter, September 27, 1941

NCE FIELDS

PLANT PATHOLOGY

New Plant Disease Attacks Mimosas

MIMOSA trees, widely planted for ornament and shade throughout the warmer parts of this country, are in danger from a new disease, combining symptoms of the plant diseases known as wilt and yellows. It kills a large proportion of the trees.

The new disease, described (*Phytopathology*) by Dr. E. Richard Toole of the U. S. Department of Agriculture, was originally discovered by a fellow worker in the Department, Dr. George H. Hepting, with headquarters at Asheville, N. C. It is known at present to be distributed from Virginia to Georgia.

Science News Letter, September 27, 1941

ARCHAEOLOGY

Prehistoric Indians Could Have Used Farm Relief

FOR WANT of something like modern America's alphabetic farm relief, Indian farmers of prehistoric America were repeatedly routed in the battle with drought in the central Great Plains. Highly organized help was out of the question in their day. They could only abandon corn patches and homes and retreat east when a blitzkrieg of dryness came.

So it appears from an enlightening study of Indian experiences at farming in areas of Kansas and Nebraska, by Dr. Waldo H. Wedel, Smithsonian Institution archaeologist. Dr. Wedel finds from buried remains that no less than four times Indians established farming settlements in the region, and later dryness temporarily choked the land.

It need not be assumed that any major change in climate occurred, the archaeologist points out. A few rainless years would have forced the Indians out, and modern farmers with whom he has talked say that five years of dryness are enough to kill grass and start serious soil damage. In the white man's farming, unwise spread of intensive cultivation into unreliable regions has been sometimes blamed for tragedy, but the plains Indians were small-time farmers who put no such strain on the land.

The picture of prehistoric Indian farm economics in the area is still not completely clear, says Dr. Wedel in a report.

He concludes:

"It begins to look as though alternate settlement and abandonment was true of primitive man's occupation of the western plains just as it has characterized the subsequent white man's tenure where large-scale government aid was not forthcoming during periods of adverse climatic conditions."

Science News Letter, September 27, 1941

NUTRITION

Discovery of Eighth Vitamin B Announced

DISCOVERY of a new vitamin, the eighth in the large group of B vitamins, was announced by Dr. Roger J. Williams, of the University of Texas, at the vitamin symposium at the University of Chicago.

The new vitamin is folic acid, taking its name from the Latin word for leaf because it is found in great abundance in leaves. Like the other B vitamins, folic acid is universally present in all animal tissues examined as well as leaves, Dr. Williams said.

Science News Letter, September 27, 1941

ENGINEERING

Danger of Static Reduced By Powder in Inner Tubes

DANGER of fires and explosions on gasoline trucks and other motor vehicles, due to the building up of static electrical charges to the sparking point, is reduced by a very simple method, S. M. Cadwell, N. E. Handel and G. L. Benson of the U. S. Rubber Company told the meeting of the American Chemical Society in Atlantic City.

All that is necessary is to place in each inner tube a small amount of a special electrical conducting powder. The greater part of the static charge built up on a motor vehicle is due to the friction of tires on pavement, and is transferred from the tires to other parts of the car.

Fear of fire or explosion from static spark is the reason for the grounding-chains which practically all gasoline trucks trail. Frequently one gets an unexpected demonstration of the static capacity of a car on reaching for a door handle and having a nice, fat, blue spark jump out and bite a finger.

Science News Letter, September 27, 1941

GEOLOGY

Uncle Sam Takes Over Kentucky's Mammoth Cave

See Front Cover

UNDERGROUND RIVERS form sharp bends, just as surface streams do, Ranger Naturalist Arthur Lundahl tells a nice audience of one, in the depths of Kentucky's Mammoth Cave, as shown on the front cover of this week's SCIENCE NEWS LETTER.

The National Park Service is taking over operation of the famous cave in September, replacing a joint arrangement whereby sightseeing has been managed cooperatively by the State of Kentucky, the Mammoth Cave National Park Association, and the National Park Service.

The hikers are shown in Boone Avenue, one of the cave's longest, narrowest roads. The geology lesson is that long ago a river of ancient America ate away limestone in giant slow bites to form or enlarge such channels underground. Abandoning the Boone Avenue level, which is three levels down, remnants of the stream now flow five levels underground, as low as 360 feet from surface.

Science News Letter, September 27, 1941

MEDICINE

Vitamin B_2 May Be Cure For Lice, Bloodshot Eyes

IF JOHNNY gets lice in his hair, mother may in future abandon the fine-comb and start giving him doses of riboflavin, it appears from a discovery reported by Prof. Paul Gyorgy, of Western Reserve University, at a vitamin symposium at the University of Chicago.

Affliction with lice as well as a serious bloodshot condition of the eye sometimes leading to blindness are among the results of diets deficient in this vitamin, Prof. Gyorgy reported. Discovery of the eye condition resulting from lack of the vitamin, and its cure by doses of the vitamin, had previously been made by the U. S. Public Health Service.

At first when rats on a riboflavin-free diet were found to have lice, the condition (pediculosis) was not ascribed to the diet, but further studies showed that the laboratory rats never got the condition when they received plenty of the vitamin, and the lice disappeared from the other rats when they were dosed with riboflavin.

Best food sources of the vitamin are milk, liver, kidneys and eggs, Prof. Gyorgy declared.

Science News Letter, September 27, 1941

ASTRONOMY

Mars Comes Close

Brighter Than Any Other Object in the Sky Save Only Venus, This Ruddy Planet Shines All Through Evening

By JAMES STOKLEY

BRIGHTER and more prominent than they were a month ago are the four bright planets of our evening sky. These, with the bright stars now beginning to appear as heralds of the brilliant skies of winter, make October evenings particularly beautiful.

The first planet you will see is Venus, in the west, setting about two hours after the sun. This is the brightest of all stars or planets now seen—of magnitude minus 3.7 in the astronomer's scale. (Because the accompanying maps are drawn for 10 o'clock on the evening of Oct. 1 and 9 o'clock on the 15th, by which times Venus has set, they do not show this planet.) There is no difficulty in finding it, because of its splendor.

Just about the time that Venus is setting, Saturn is rising in the east. It is in the constellation of Taurus, the bull, and is indicated on the maps. Of magnitude zero, it is the faintest of our four planets, though it surpasses any star now visible.

Throughout the night we can see Mars, in Pisces, the fishes, second only to Venus in brightness, with magnitude minus 2.4. Directly opposite the sun on Oct. 10, it rises at sunset and sets at sunrise. During October (on the third) it is unusually close to earth, which makes it so bright.

About three hours after sunset, Jupiter appears, like Saturn, in the figure of Taurus, to the east. Its magnitude is minus 2.2, only slightly fainter than Mars. It is not shown on the maps.

Distance Dims Stars

Though the stars, actually distant glowing suns, are really many times brighter than the planets, which shine by reflected sunlight, they are so far away that they appear considerably fainter. Vega, in Lyra, the lyre, is the brightest now on view, high in the west. Above it is Deneb, of Cygnus, the swan. To the left of Vega is Aquila, the eagle, with Altair.

Shining in the east, in Taurus, just below Saturn, is Aldebaran, while next to this group, to the left, is Auriga, the charioteer, in which Capella is found. And the last of the six first magnitude stars shown on the maps is Fomalhaut, in Piscis Austrinus, low in the south.

At this time many astronomers are turning their telescopes on Mars, because of the neighborly visit it is making to our part of the solar system. On Oct. 3 it is closest, the distance 38,100,000 miles.

If this seems far, just remember that the nearest Mars can possibly come to the earth is 34,600,000 miles, so this is really very good. Also, when it is closer, as it was in fact, in 1937 and 1939, it is farther south in the sky.

That means that for people in the southern hemisphere it is beautifully seen, high in the sky, but for us, in the northern parts of the earth, it is quite low. Now it reaches a quite respectable altitude, and this, for northern observatories, counteracts the slightly greater distance.

Lowell, Chief Center

Chief center of Martian study is the Lowell Observatory, in Flagstaff, Arizona. This was founded by Dr. Percival Lowell, a wealthy amateur astronomer who made great contributions to the science. He was particularly interested in the planets, in Mars especially, and after his death in 1916, his successors have carried on these studies. Earl C. Slipher, brother of Dr. V. M. Slipher, present director of the observatory, is the principal Martian observer.

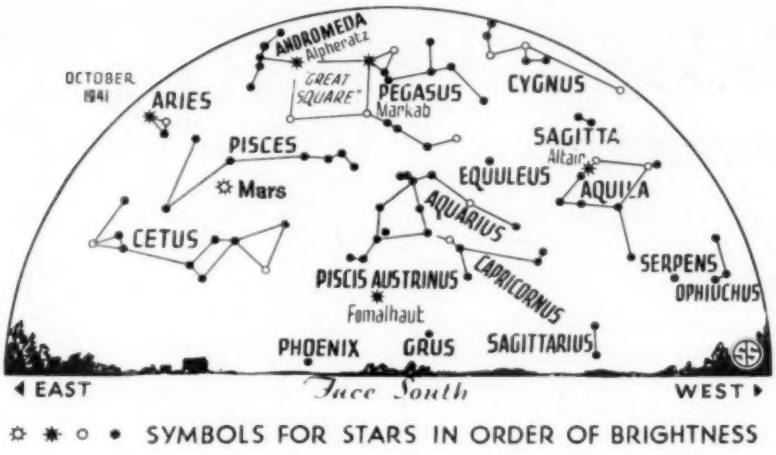
Mention Mars and most people think of canals. It was in 1877, when Mars made another close approach, that the Italian astronomer, Giovanni Schiaparelli, discovered on its surface some peculiar straight lines that he called "canali." The word should really be translated into English as "channels," but somebody rendered it as "canals' and this name has been applied to them ever since.

Since this word suggests an artificial waterway, in contrast to a natural "'channel," it helped popularize the idea of inhabitants of Mars. However, this theory had good scientific backing for Prof. Lowell himself held to it. He thought that the network of lines, going so straight across the surface of the planet, could only have been placed there by some intelligent beings. He then concluded that they really were canals, used to augment a Martian scarcity of water by carrying the liquid from the melting snows at the poles.

Though they do not have any very good explanation for the "canals," very few astronomers today hold to the Lowell theory. In any event, the possibility of life on Mars seems ruled out by the apparent lack of essential oxygen in its atmosphere. At the Mt. Wilson Observatory, comparisons have been made between the light from Mars and that of the sun. When sunlight passes through the earth's atmosphere, certain colors are removed by the oxygen, producing dark lines when the light is analyzed into a spectrum band of color.

No Oxygen Revealed

The sunlight which falls on Mars and is reflected to make the planet visible to us, also shows these lines, because it too has to pass through our atmosphere. But it also passes through the Martian atmosphere twice—on its way to the surface and on its way out again. Thus,



ASTRONOMY

Second Neujmin Comet Proves To Be Old One

A SECOND COMET announced by the Soviet astronomer, Neujmin, a little more than a month after his independent discovery of the du Toit-Neujmin comet (See *SNL*, Sept. 20), proves to be an old one, the Schwassmann-Wachmann (1), 1925II, which was picked up on Harvard plates in South Africa in August. The identification was made by Mr. L. E. Cunningham of Harvard College Observatory.

Science News Letter, September 27, 1941

if there were oxygen above Mars, the effect would be enhanced in the spectrum of light from that planet.

As nearly as we can tell, however, the lines are exactly the same. It is estimated that if Mars had an atmosphere with one-thousandth the amount of oxygen that we have, some difference could be detected.

Now that Mars is close once more, these and other matters are again being studied. After the planet draws away from its visit, we may know a little bit more about some of its secrets.

Celestial Time Table for October

Friday, Oct. 3, Mercury farthest east of sun, sets about ¾ hour after sunset; 2:00 a.m. Mars nearest earth, distance 38,130,000 miles. **Sunday, Oct. 5,** 3:32 a.m., Full moon; 5:34 p.m., Moon passes Mars. **Wednesday, Oct. 8,** 10:53 p.m., Moon passes Saturn. **Thursday, Oct. 9,** 1:00 a.m., Moon farthest; distance 252,100 miles. **Friday, Oct. 10,** 3:00 a.m., Jupiter stationary, then starts apparent westward movement among stars; 8:00 a.m., Mars opposite to sun; 11:09 p.m., Moon passes Jupiter. **Monday, Oct. 13,** 7:52 a.m., Moon in last quarter. **Monday, Oct. 20,** 9:20 a.m., New moon. **Tuesday, Oct. 21,** 9:00 a.m., Moon nearest, distance 222,900 miles. **Wednesday, Oct. 22,** Early morning, Meteors seen of shower which seems to radiate from constellation of Orion. **Thursday, Oct. 23,** 12:13 p.m., Moon passes Venus. **Monday, Oct. 27,** 12:04 a.m., Moon in first quarter.

Science News Letter, September 27, 1941

● RADIO

Thursday, October 2, 3:45 p.m., EST

On "Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. William H. Martin, director of the New Jersey Agricultural Experiment Station, will describe vitamin research studies with pigs.

Listen in each Thursday.

Monday, October 6, 9:30 p.m., EST

Science Clubs of America program over WRUL, Boston, on 6.03 and 11.73 megacycles.

First in a series of regular periods over this short wave station to serve science clubs, particularly in high schools, throughout the Americas. Dr. Harlow Shapley, Chairman of Science Service executive committee, director of Harvard College Observatory, will speak. Have your science group listen in at this time.

PHYSICS

Squeaks of Dry Ice Pick Out Precious Stones from Fakes

Carbon Dioxide, Changing From Solid to Gas Causes Heat Conducting Substances To Vibrate; Glass Will Not

DIAMONDS and pearls can be distinguished from the counterfeits by touching them with a piece of dry ice. The real article emits a squeak or rattle; imitations do not. Quartz can be distinguished from common glass, and in general semi-conductors of heat from non-conductors.

These and other useful applications of the squeak caused by solid carbon dioxide or dry ice were pointed out by Miss Mary D. Waller of the London School of Medicine for Women in the British journal *Nature*. (Aug. 16.)

The mechanism of the squeak, she explains, is this: Solid carbon dioxide when heated passes directly from the solid to the gaseous state, skipping the liquid state. This property, shared by a number of other substances, like iodine, sulphur, carbon, is called sublimation. When a pointed piece of the dry ice is presented to a conductor of heat such as a metal plate, heat is conducted by the plate to the ice and turns some of the latter to gas. A powerful stream of gas issues from the point, as from a nozzle, and pushes away part of the plate immediately in front of it. As soon as this happens, the passage of heat to the dry ice stops, the gas stream stops, and the plate by virtue of its elasticity returns to contact. The whole thing is repeated over and over from 1000 to 4000 times a second. The plate is thus set into vibration emitting high pitched notes from two to four octaves above middle C.

If a piece of glass or other non-conductor of heat is touched with the dry ice, no sound is emitted.

By careful manipulation, the usual squeak can be converted into a very pure musical note. This can be accomplished by lightly touching a high-pitched tuning fork with a well-pointed piece of the dry ice. Much depends on the skill of the operator in sensing the onset of the vibrations and then maintaining just the proper touch to sustain them. Similarly, metal plates may be made to vibrate and emit their overtones, thus producing the well-known Chladni figures. These are beautifully regular geometric figures, some of which have been used for decorative designs. Want of uniformity or flaws in plates may be discovered by distortions in the normal figures.

Science News Letter, September 27, 1941

In the frequently bombed port of Hamburg, German *camouflage* experts tried to confuse British fliers by covering a lake near the railroad with dummy buildings on floating rafts.

Describing one of America's most popular *wild ducks*, a government biologist says: "When hunted persistently, the mallard becomes extremely wary and develops nocturnal habits."

GENERAL SCIENCE

Science Service Backs Science Clubs Movement

Science Clubs of America To Include Junior as Well as Adult Groups

A NATIONAL science activity, Science Clubs of America, is being sponsored by Science Service, the institution for the popularization of science, which publishes the SCIENCE NEWS LETTER.

In every locality throughout the nation there will be groups active in various fields of science.

Science Clubs in high schools will be encouraged and given the opportunity to join in the national movement and enter into national activities.

Groups of enthusiastic amateurs in science—grinding telescope mirrors, collecting insects, breeding new plants, collecting minerals, or pursuing scores of other interesting avocations—will join in this important development.

Members of Science Clubs of America will be of all ages. Youth or age is no bar to participation.

800 Clubs as Nucleus

As the nucleus of Science Clubs of America, sponsored by Science Service, there are over 800 junior science clubs which were organized during the past 14 years by the American Institute of the City of New York. These clubs are located not only in the United States but also in Puerto Rico, Hawaii, the Philippines, British West Indies, Alaska, Canada and even Portugal.

Science Service joins the American Institute of the City of New York, an institution chartered in 1828, in developing the science clubs movement. Science Service will sponsor Science Clubs of America as the national science clubs movement. The American Institute will continue to foster junior science clubs and related activities in the State of New York and the metropolitan area of New York City.

An advisory committee on Science Clubs of America, representing jointly the American Institute and Science Service, is being formed.

In developing this broad science clubs movement, there will be enlisted the enthusiasm, support, and participation of newspapers, museums, schools, and other scientific and educational institutions, including professional scientific societies and industrial organizations.

Local "Science Centers"

In various regions there will be developed additional "science centers" which, on a regional or local basis, will further coordinate and aid the science clubs in their vicinities as a supplement to the national organization.

In simultaneous communications to sponsors of existing science clubs, Dr. H. C. Parmelee, president of the American Institute, and Watson Davis, director of Science Service, have announced the new plan.

"About 14 years ago,' Dr. Parmelee said, "when The American Institute was rounding out 100 years of service to American industry, the leaders of this century-old organization launched a wholly modern activity that was, nevertheless, in harmony with the oldest and finest traditions of the Institute. They started a program to encourage and develop an interest in science among the youth of the metropolitan area of New York City. That movement shortly resulted in the organization of about 200 Junior Science Clubs, a Junior Science Fair, and a Junior Science Congress.

"Attracted by the success of the local movement, and believing firmly in the value of scientific knowledge and training among the youth of the country, the Westinghouse Electric & Manufacturing Company placed at the disposal of the Institute means for extending the Junior Science Club movement and related activities throughout the United States. The program met with unparalleled success and resulted in the organization of over 800 clubs. Indeed, the movement expanded beyond the present capacity of the Institute to service all of the Clubs and foster their related activities.

"At this juncture Science Service, an institution for the popularization of science, with headquarters in Washington, D. C., and excellent national contacts and affiliations, proposed to the Institute a division of responsibility in the Junior Science Program.

"Speaking for The American Institute, I commend the joint plan as a step in the achievement of common objectives; and I believe that both working together can accomplish more than each separately."

Great Service to Youth

"The work that you are doing in inspiring and directing a science club is one of the great services to American youth," Mr. Davis told the sponsors. "In order that we may have a continuance of our democratic civilization based on scientific principles, it is essential that such endeavors as yours shall be given the fullest possible support and that other leaders of youth follow your example.

"It is in this spirit that Science Service, the institution for the popularization of science, joins its forces with those of The American Institute in continuing, extending and developing the science club movement."

Science Clubs of America will have a regular broadcast period on the international broadcast station WRUL, Boston, on Mondays at 9:30 p.m. EST on 6.04 and 11.73 megacycles, beginning Oct. 6. Anyone having a shortwave receiver is invited to listen in.

Those interested in cooperating in Science Clubs of America, particularly science teachers, will be sent details if they send a postal card to Science Service, 1719 N St., N. W., Washington, D. C., requesting Science Clubs of America information.

Science News Letter, September 27, 1941

The Soviet Union's largest *automobile plant* is at Gorkii, formerly known as Nizhni-Novgorod.

The average *adult male* of western Europe is usually said to weigh 155 pounds, whereas the average in southeast Asia is about 110 pounds.

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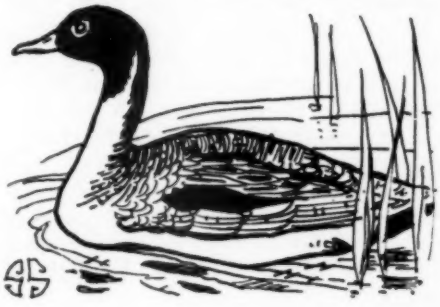
CONSERVATION

NATURE RAMBLINGS

by Frank Thone



Ducks, Limited

DUCKS flying south from Canada this fall will not be as abundant as was hoped earlier in the year because of severe drought on the great nesting grounds in the western provinces, Hoyes Lloyd, superintendent of wildlife protection in the Canadian National Parks Bureau, stated at the meeting of the International Association of Game, Fish and Conservation Commissioners.

The winter was mild in Canada last year, and there was less than the normal depth of snow. Thaws came slowly in the spring, so that the snow water soaked into the ground instead of forming sloughs and ponds affording good duck nesting sites.

Cool weather and heavy rains in May and June de'ayed the crisis, but during July heat and drought dried up the waters that the duck families needed for survival. Latest available data indicate conditions as bad as they were in the drought year of 1931.

Mallards have probably escaped the decimation caused by drought to other species. Mallards, Mr. Lloyd explained, habitually nest in willow swamps along streams and other areas not seriously affected by lowered water levels.

Why we don't get more ducks faster, despite closed seasons and all the help man has been trying to give his broad-billed friends lately, was told by T. C. Main, general manager of Ducks Unlimited (Canada).

Of 60 million ducks that flew south last fall, 40 million returned to Canada. Of these 40 million, not all are capable of rearing families: there is a large excess of males over females, and of the nesting pairs that do form, about a fifth prove infertile.

After allowing for all these handicaps, the 40 million ducks arriving at the breeding grounds should produce 109 million ducklings. On this great crop, a whole series of lethal factors go to work. They range from drought, through predatory birds and beasts to poaching Indians and halfbreeds, and they kill some 80 million of the little ducks, leaving only 29 million to go south with their parents on their first migration flight.

Mr. Main expressed the belief that practicable measures can be taken to cut these losses by at least half.

Science News Letter, September 27, 1941

INVENTION

New Machine Bales Discarded Tin Cans

DISPOSAL of empty cans will be facilitated by an invention recently patented. It consists of a tubular press by which the cans are crushed into a compact stack and neatly tied up with wire. It can be operated either by compressed air or hydraulic power. Around filling stations it should be particularly useful. (*Mansel S. Wells, Shinglehouse, Pa. Patent No. 2,234,098.*)

Science News Letter, September 27, 1941

The Safety of Millions Depends on Eyes Like These

WITH you, as with us, *defense comes first.* Our output of optical instruments is being rapidly increased to meet the defense emergency. We will endeavor to give our customers the best service possible under existing circumstances, and ask your sympathetic cooperation.

THROUGH the cold dank dusk a watcher scans the gaps between the scattered clouds. His first glimpse of oncoming bombers sounds the alarm that sends thousands to the safety of their shelters and the defenders to their duties. Four thousand miles away, aboard a heavily laden freighter, the captain studies the silhouette of a ship on the horizon, to determine whether friend or foe. This is serious work for binoculars, work worthy of those known as the world's finest.

Bausch & Lomb is a builder of such binoculars. Producer, too, of many other instruments that utilize the principles of optical science to the advancement of the common good; of metallographic microscopes, through the use of which research physicists obtain more nearly impenetrable armorplate—or build extra thousands of miles into your next automobile engine; of spectrographs that analyze the chemical composition of crude oil—or of a die casting; of spectacle lenses that open up a world of learning to a school child whose mind might have been dulled by defective vision.

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PHYSIOLOGY

Every Life Process Governed By Enzymes and Vitamins

Millions of Body's Cells Obtain Their Energy From Chemical Reactions Made Possible by These Substances

By DR T. R. HOGNESS

Professor of Chemistry, University of Chicago.

(At the Universities of Wisconsin and Chicago week-long meetings on enzymes and vitamins have been taking place. This is an expert evaluation of this important branch of science from a talk arranged by Science Service over the Columbia Broadcasting System.)

BECAUSE of the very small quantities of vitamins necessary to maintain growth or to correct deficiencies which impair normal body functions, chemists have for many years suspected that the vitamins are not consumed, as is sugar for instance, in the normal cell functions, but rather that the vitamins in some way act as catalysts or promoters for other energy and growth-producing chemical reactions which take place in the body.

About eight years ago this suspicion was confirmed by direct experimental evidence and since that time many other experiments have been made by biochemists which have corroborated this original finding until today we know just what the chemical action of several of the vitamins is.

Before I tell you something about the chemical action of the vitamins, I should first explain what the chemist means by the word catalyst, or catalysis. To do this I shall use a rather common chemical example: the manufacture of ammonia from hydrogen, obtained from water, and nitrogen, obtained from air. Incidentally this is a very important chemical reaction in these days, for it is from ammonia that nitric acid is made, and nitric acid is used in making practically all explosives. The hydrogen and nitrogen are mixed and compressed and even under high pressure nothing would happen; that is, there would be no chemical reaction, unless there were present in this mixture some very specially made iron. With this iron present, the nitrogen and hydrogen combine with each other and as a result ammonia is formed. In this case the special iron is the catalyst. It brings about or promotes the reaction. The iron is not used up and a relatively small amount of it can bring about the conversion of a large amount of nitrogen and hydrogen to ammonia. The whole promoting process is known as catalysis.

Chemical reactions in the body produce the heat and energy necessary for maintenance of life and growth. The food we eat and the oxygen in the air that we breathe combine with each other and form water and carbon dioxide which is then exhaled from the lungs. This burning process produces energy (or work) and heat just as the burning of coal in the firebox of the locomotive produces work and heat. But this burning process in the body—or more exactly in the cells of the body—can not take place unless catalysts are present.

Sugar left by itself cannot burn or be consumed by air at ordinary room temperature or even at the temperature of the body. Every man, if he stops to consider, knows that this is so. Sugar, or a solution of sugar, can be left in an open dish exposed to air and the sugar does not disappear. But if the sugar is eaten it is converted into carbon dioxide and water in a relatively short time. The difference lies in the presence of catalysts in the cells of the body. The catalysts are therefore very important.

This is where the vitamins come into play. They are the catalysts; rather, they are used by the body to make the catalysts necessary to bring about the chemical reactions which actuate and regulate the life processes. We might even go so far as to make a reasonable guess that the agency governing every life process is a catalytically controlled chemical reaction.

The catalysts which bring about the chemical reactions occurring in the body or the cell—these processes also take place in bacteria and other small organisms—have been given a special name. They are known as enzymes.

The human body is composed of millions of cells and each of these cells has a certain function to perform. It has a job to do, but to do this job it must have energy which it derives from chemical reactions involved in the burning of food. To bring about the chemical reactions in the right place the cells contain the different enzymes or catalysts necessary to produce the chemical reactions, which, in turn, carry out the job assigned to the cell. If the enzymes are lacking, the chemical reactions will not take place and the job will not be done. The result may be some disease such as pellagra or beri-beri.

Some place in the body the necessary enzymes are produced—perhaps in the cell which is going to need them—but to do so certain starting materials are necessary. These starting materials necessary to make the catalysts are the vitamins. The body modifies these vitamins, more or less as the case may be, hitching other substances present in the body to them, and as a result enzymes are formed.

The process of burning a sugar molecule in the body is a complicated one, involving many steps. Each step involves a different enzyme or catalyst. The chemist is trying to learn specifically what each of these steps consists of and which enzyme is involved in which step. We now have a considerable knowledge in this field, a resume of which was just given at the symposium at the University of Chicago and the University of Wisconsin.

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We know, for example, that when a human being is suffering from pellagra, which specific steps in the oxidation process are not operating. They do not operate because they lack the necessary enzymes and the body cannot produce these enzymes unless the patient is given nicotinic acid. Although we know a great deal, there is yet very much more to be learned in this field. Much scientific endeavor is therefore turned in this direction and in the next few years considerably more will be known about these fundamental life processes.

Science News Letter, September 27, 1941

PUBLIC HEALTH

Tuberculosis Increasing In War Torn Europe

TUBERCULOSIS is now taking an increasing toll in war torn Europe, and in less advanced countries the death rate is likely to mount to frightful proportions as in 1914-1918. So statisticians in the United States are convinced.

"Despite absence of statistics, it is certain that tuberculosis is on the rise in all the areas that have been overrun," says a report by Metropolitan Life Insurance Company statisticians.

Clues are revealed in reports from lands outside the Nazi grip. Vichy reports a sharp increase in tuberculosis. In England and Wales the tuberculosis death rate for male civilians has risen 13%. For females the increase was 7%.

The longer the war, and the farther it extends, the greater will be the tuberculosis toll, particularly on the Continent, the statisticians predict. In World War One, every belligerent country had an increase in this disease, and practically all neutral countries of Europe had an actual increase or were set back in their fight to control tuberculosis. In England, pulmonary tuberculosis deaths were 25% higher in 1918 than in 1913. Among German women the rate was nearly 75% higher.

While Germany today is in the most favorable position of the Continental areas, the statisticians say it is unlikely that Germany has escaped an increased tuberculosis toll in this war.

Science News Letter, September 27, 1941

Russian officials compare *Moscow* with Chicago, saying that it has about the same population and is an all-around industrial center.

Lignin, a substance in woody tissue, is reported to be a good source of vanillin for flavoring agents.

New Machines And Gadgets

Novel Things for Better Living

Where's that safety pin? will no longer be heard in baby's room if a pinless diaper recently patented is used. Nor will the baby's shriek be heard as careless Papa essays to "change the baby." The new diaper is of a special shape, with a ribbon attached at one end and four slots on the opposite side. The diaper is folded on in the usual way, the ribbon is passed through the slots, and a pretty bow is tied. Thus the garment is ornamental as well as useful, and baby will doubtless be proud of his very modern attire.

Burnt-out bearings will be a less frequent source of trouble and delay if use is made of one of a new line of "dry" oils now on the market. The oils are black and forbidding in color because they contain graphite in a finely divided state. When the oil dries out it leaves a thin film of dry graphite on the bearing surfaces. This prevents metal-to-metal contact and thus saves burning or abrasion in case of a delay in providing a new supply of oil.

An awning made like a Venetian blind has recently been patented. In place of slats it uses miniature awnings, one above the other, which therefore hang close to the window. It can be pulled part way or all of the way down, to cover any desired portion or the whole of the window—something that cannot be done with the ordinary awning.

A robot trailer brake, completely automatic in its operation, has recently been patented. When the towing car slows down, or holds back on a down grade, the trailer brake, all by itself, without human aid, sets itself so as to prevent the trailer from bumping into the car or pushing it. As soon as the trailer has been slowed down to the speed of the car, the brake releases itself. Thus the driver is relieved of all worry about the trailer. The mechanism can also be locked out of operation when the car is backing or maneuvering.

Old automobile bodies are now compressed by a huge press into a tight bale in a few seconds, and truckloads and carloads of these bales are shipped daily to the steel mills. Formerly old automobile bodies have lain rusting on out-of-town lots because there was no quick way of handling them.

Head down, eye on the ball, will not be easily forgotten by golfers if they use a recently patented "golfer's training rack." A sort of helmet, which is

attached to supporting arms that are adjustable according to the golfer's height, holds the head still and in the proper position while the golfer executes his swing. The whole apparatus is supported by a platform on which the golfer stands. With head and feet fixedly in place, the inventor claims that the body is forced to execute the proper pivotal motion, and that practice with this device will obviate the services of a more expensive human instructor.

Balloon fabrics and other fabrics that must be as nearly gastight as possible can now be tested for leakage by means of a new "fabric permeameter." The test requires only a few minutes and the meter reads directly in "liters per square meter per 24 hours." A liter is a trifle more than a quart, and a square meter is a little larger than a square yard. Tests of the effectiveness of the various dopes with which the fabrics are treated, as well as leakage at the seams can be made. In addition to many other applications connected with National Defense, the instrument can be used to test materials for packaging tobacco products, foods, and other substances in which aroma is important.

If you want more information on the new things described here, send a three-cent stamp to Science News Letter, 1719 N St. N. W., Washington, D. C., and ask for Gadget Bulletin 72.

Science News Letter, September 27, 1941

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•First Glances at New Books

AERONAUTICS

AIR PILOTING, Manual of Flight Instruction (rev. ed.)—Virgil Simmons—*Ronald Press,* 758 p., illus., $4. As in the first edition (1938) this book aims, apparently with much success, to illustrate and describe the best known means of developing pilot skill, and also to supply the technical information which the would-be pilot must have in passing his various examinations.

Science News Letter, September 27, 1941

MEDICINE

THE FOOT AND ANKLE, Their Injuries, Diseases, Deformities and Disabilities (2d ed.)—Philip Lewin—*Lea & Febiger,* 665 p., illus., $9. See p. 200.

Science News Letter, September 27, 1941

FISHERIES

NEW ENGLAND'S FISHING INDUSTRY—Edward A. Ackerman—*Univ. of Chicago Press,* 303 p., illus., $4. A book that can be read with profit not only by persons professionally interested in fisheries but by the "run-of-the-street" citizen who eats fish occasionally and also gives an occasional thought to the general welfare of his country.

Science News Letter, September 27, 1941

AGRICULTURE—ECONOMICS

BETTER FARM LIVING, Family Aspects of Rural Life in the South—Paul W. Chapman—*Science Research Associates,* 208 p., illus., 84c. A book for use in the grade schools. If every farm child, white and colored, in the South were to learn all the lessons set forth here, and put them into practice when he grows up and has some land to look after, it wouldn't be long before folks elsewhere could stop feeling sorry for the rural South—a situation which must be irritating to every Southerner.

Science News Letter, September 27, 1941

AGRICULTURE—ECONOMICS

AGRICULTURAL PRICE ANALYSIS—Geoffrey S. Shepherd—*Iowa State College Press,* 402 p., $3.75. A book primarily for economists and price statisticians. To the layman, it tells at least that in the farm market things are not always what they seem.

Science News Letter, September 27, 1941

ENGINEERING

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Vol. 142, Petroleum Development and Technology, 1941, Petroleum Division—*American Institute of Mining and Metallurgical Engineers,* 587 p., $5. Includes the papers and discussions presented before the Division at the meetings held in New York, Los Angeles and Tulsa during 1940, in which many phases of the petroleum industry are covered.

Science News Letter, September 27, 1941

TECHNOLOGY

INDUSTRIAL PLASTICS (2d ed.) — Herbert R. Simonds—*Pitman,* 385 p., illus., $4.50. The enormous progress made in plastics in the past few years makes a new edition of this comprehensive yet simply worded treatise very welcome. A considerable portion of the original text has been rewritten and brought up to date, a section has been added on Plastics in War Time, and material has been included concerning new types of plastics developed since the first edition.

Science News Letter, September 27, 1941

CLIMATOLOGY—ANTHROPOLOGY

ENVIRONMENT AND NATIVE SUBSISTENCE ECONOMIES IN THE CENTRAL GREAT PLAINS — Waldo R. Wedel—*Smithsonian Institution,* 29 p., illus., 20c. See page 201.

Science News Letter, September 27, 1941

HYGIENE

PERSONAL HYGIENE APPLIED (7th ed., rev.) — Jesse Feiring Williams — *Saunders,* 529 p., illus., $2.50.

Science News Letter, September 27, 1941

PHARMACY

DRUG AND SPECIALTY FORMULAS—Emil J. Belanger—*Chemical Pub. Co.,* 307 p., $6. This is a compilation of the tested working formulas used by the author during more than 25 years experience as a pharmacist. It includes formulas for cosmetics, drugs, household specialties, and veterinary specialties not hitherto disclosed, and a directory of "Sources of Supply."

Science News Letter, September 27, 1941

ENGINEERING

SANITARY ENGINEERING, Water Supply, Sewerage, Water and Sewage Treatment—Harry G. Payrow—*International Textbook Co.,* 483 p., charts, $4. This is an introductory text-book for sanitary engineering and other students. Especially attractive are the chapters on stream flow, dams and reservoirs. A number of original contributions to sanitary engineering are made in this book.

Science News Letter, September 27, 1941

GEOGRAPHY—HISTORY

AMERICAN POLYNESIA, Coral Islands of the Central Pacific — Edwin H. Bryan, Jr.—*Tongg Pub. Co., Honolulu, Hawaii,* 208 p., $1.50 cloth; $1 paper. An island by island account of nearly 30 picturesque isles, giving a map and brief history and outstanding facts of interest regarding each. The author, a curator on the staff of the Bernice P. Bishop Museum in Honolulu, states that accurate and up-to-date information about these islands is hard to obtain, but he has personally visited 20, and the museum has had expeditions out to the others. A 15-page bibliography completes the book.

Science News Letter, September 27, 1941

MATHEMATICS

ALGEBRA, A Text-book of Determinants, Matrices, and Algebraic Forms—W. L. Ferrar—*Oxford Univ. Press,* 202 p., $3.50. The sections on determinants and matrices are suitable for high school or college students, the part on algebraic forms for university students. The latter part contains canonical forms, orthogonal transformations, invariants and covariants.

Science News Letter, September 27, 1941

ENGINEERING

HOW TO DESIGN AND INSTALL PLUMBING (2d ed.) — A. J. Matthias, Jr. — *American Technical Society,* 442 p., illus., $3. In the new edition a chapter has been added, in which the design and installation of a complete plumbing system for a modern six-room and two-bath house are explained and illustrated.

Science News Letter, September 27, 1941

PHILOSOPHY

DICCIONARIO DE FILOSOFIA—Jose Ferrater Mora — *Editorial Atlante, S. A., Calle de las Artes, 55, Mexico, D. F., Mexico,* 598 p., $4. (American money). A dictionary of philosophy which contains not only explanations of philosophic terms but also outlines of the philosophical position of the outstanding philosophers of the world. In Spanish.

Science News Letter, September 27, 1941

BACTERIOLOGY

LABORATORY GUIDE IN ELEMENTARY BACTERIOLOGY—M. S. Marshall—*Blakiston,* 244 p., $1.75. A standard laboratory course; ring-bound, with printed directions and blank pages for notes alternating, waterproof cover. All round, a thoroughly practical manual.

Science News Letter, September 27, 1941